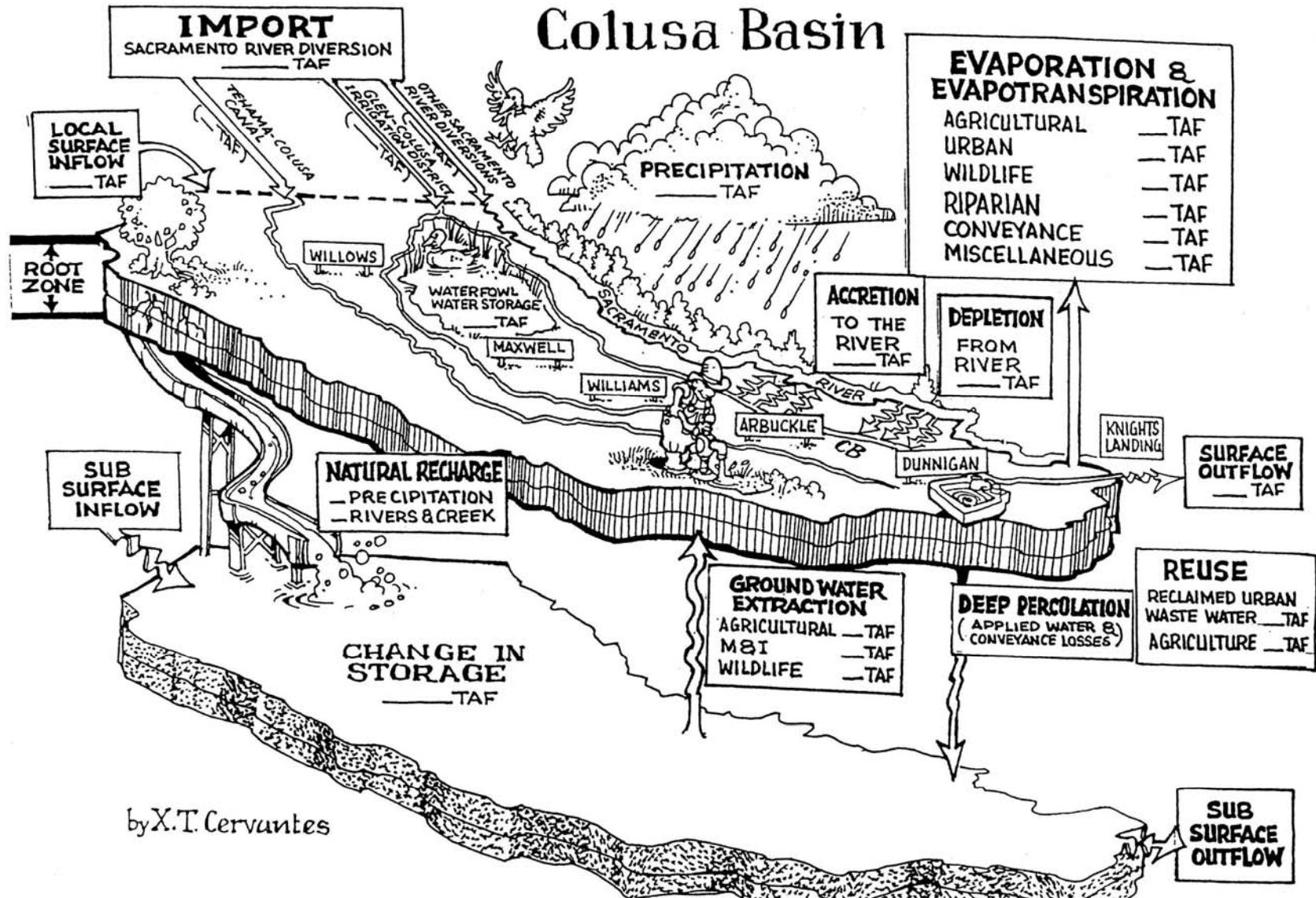




# NORTHERN DISTRICT

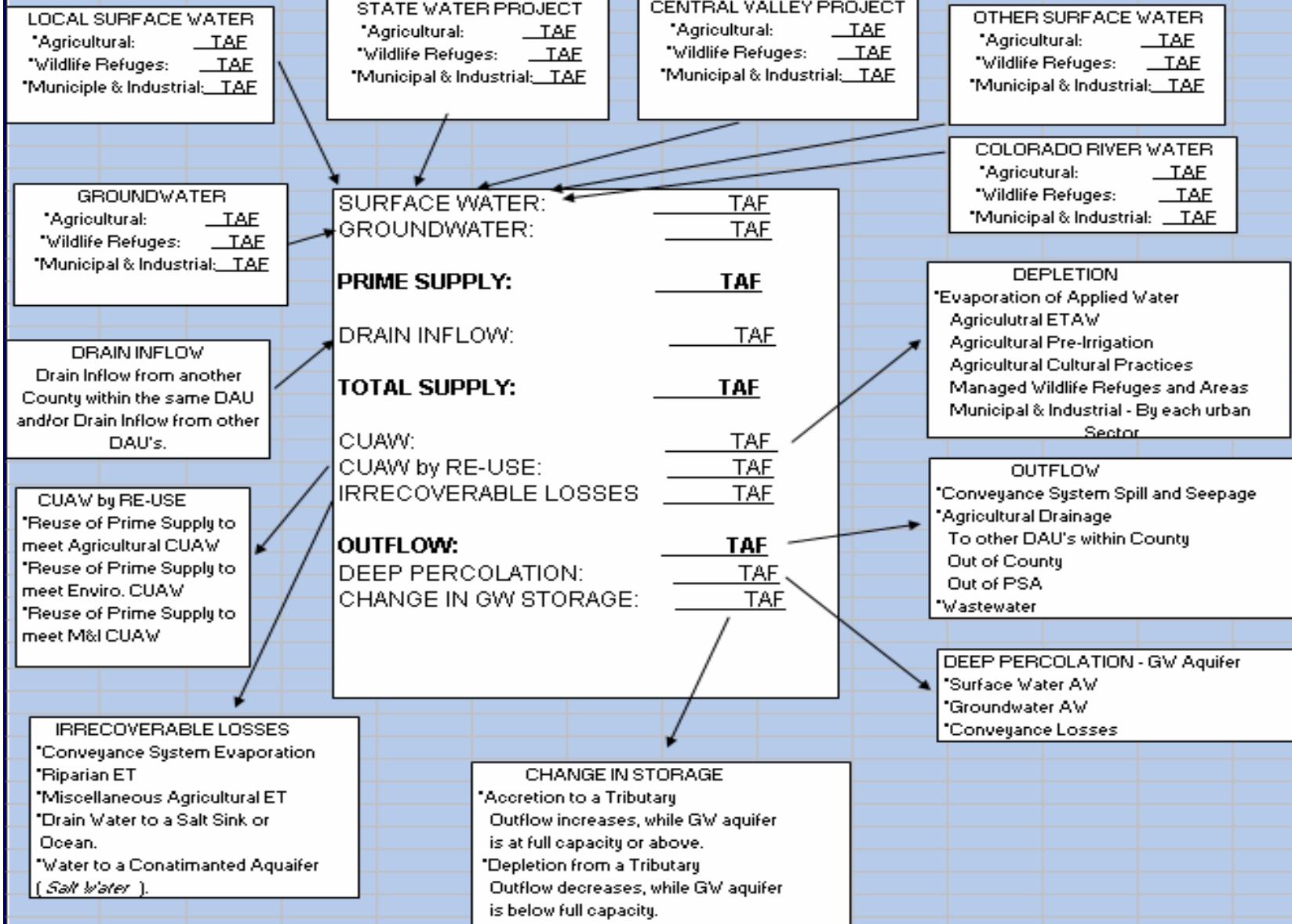


# INFLOW - OUTFLOW WATER FLOW DIAGRAM

DAU \_\_\_\_\_

COUNTY

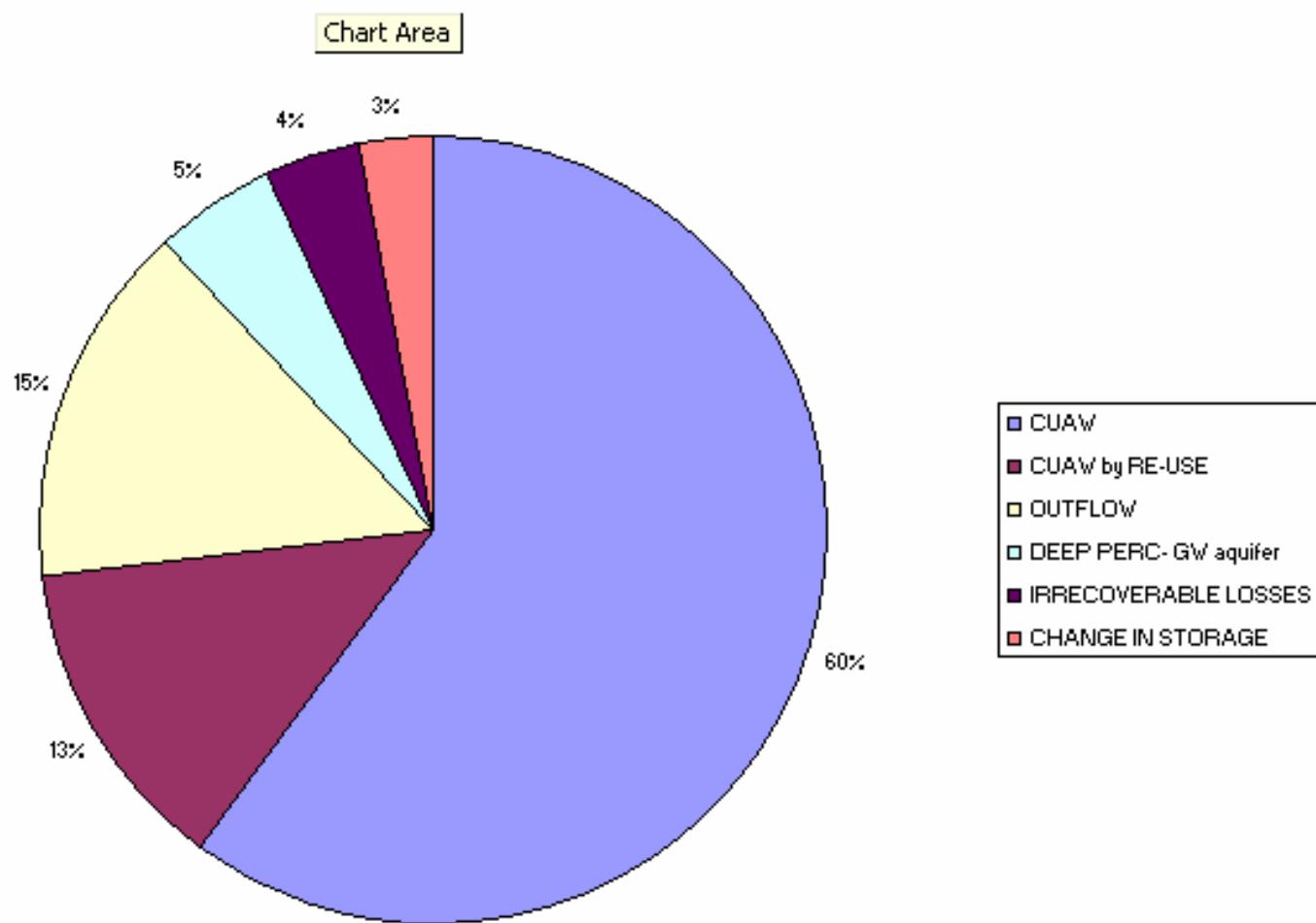
(Thousands of Acre Feet)



# Water Balance Parameters

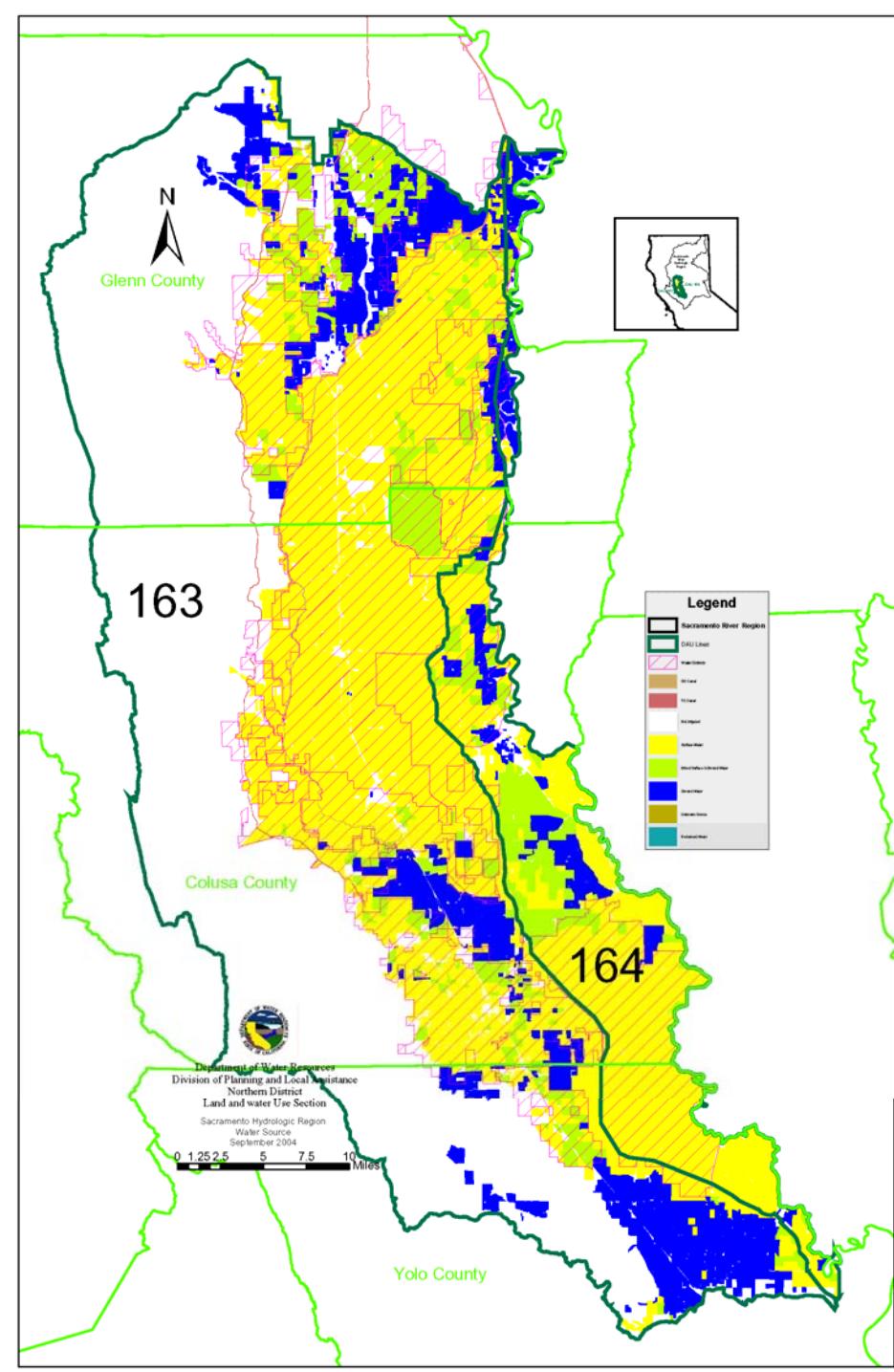
- **TOTAL SUPPLY = WATER USE**
- **CUAW** (Consumptive Use of Applied Water)
- Agricultural Evapotranspiration of Applied Water (ETAW)
- Environmental ETAW
- Municipal and Industrial
  - Single Family Interior Use
  - Single Family Exterior Use
  - Multi Family Interior Use
  - Multi Family Exterior Use
  - Commercial Uses
  - Urban Landscaping
  - Etc.
- **CUAW by RE-USE**
  - Agricultural CUAW met by RE-USE
  - Environmental CUAW met by RE-USE
  - Urban CUAW met by RE-USE
- **IRRECOVERABLE LOSSES**
  - Agricultural Conveyance System Evaporation
  - Urban Conveyance System Evaporation
  - Environmental Conveyance System Evaporation
  - Riparian Evapotranspiration (ET)
- Miscellaneous Agricultural ET
- Drain water to a Salt Sink or Ocean
- Water to contaminated aquifer (salt water).
- **OUTFLOW**
  - Conveyance System Spill and Seepage
  - Agricultural, Environmental, and/or Urban Drainage
    - To other Detailed Analysis Units (DAU) within County
    - Out of County
    - Out of Planning Area (PA) or Planning Subareas (PSA)
  - Wastewater
- **DEEP PERCOLATION** – Groundwater (GW) Aquifer
- Conveyance Losses – Deep Percolation (DP)
- Agricultural – DP
- Urban – DP
- Environmental – DP
- **CHANGE IN STORAGE** – GW Aquifer
  - Accretion to a Tributary – Outflow increases, when GW Aquifer is at full capacity or above.
  - Depletion from a Tributary – Outflow decreases, when GW Aquifer is below full capacity.

TOTAL SUPPLY = WATER USE



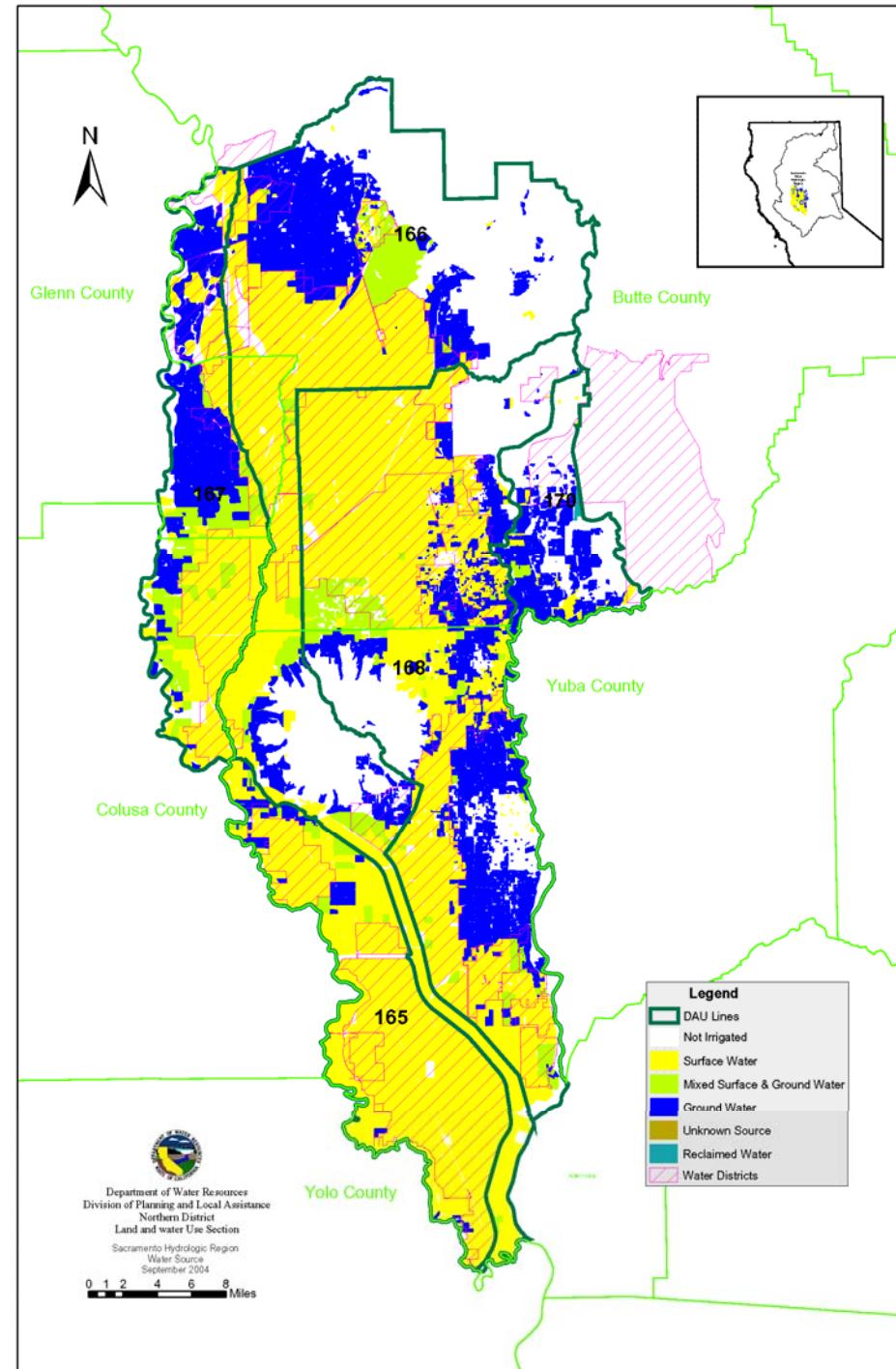
# Colusa Basin

- DAUs 163, 164
- Colusa Drain divides DAUs
- RD 108 / River Garden Farms Co. is closed a basin
- Inflow-Outflow analysis calibrated with surface outflow at
  - Colusa Drain Outfall
  - Knights Landing Ridge Cut



# Butte Basin

- DAUs 165, 166, 167, 168
  - 165 is a closed basin
  - 166, 167, 168 are not entirely watershed based
    - Movement of outflow between DAUs is difficult to estimate



**Detailed Water Balance**  
**2000 Actual Year Scenario**  
**Colusa Basin**

	GLE 163	COL 163	YOL 163	GLE 164	COL 164	YOL 164	TOTAL
S Local Surface Water	3.0 TAF	3.0 TAF	3.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	9.0 TAF
S State Water Project	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF
U Central Valley Project / Sacramento River	503.5 TAF	636.4 TAF	13.8 TAF	14.7 TAF	161.2 TAF	99.3 TAF	1,428.9 TAF
P Other Federal	2.1 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	2.1 TAF
P Ground Water	272.6 TAF	86.0 TAF	81.8 TAF	25.6 TAF	92.1 TAF	3.7 TAF	561.8 TAF
L Sub-Total (Prime Supply)	781.2 TAF	725.4 TAF	98.6 TAF	40.3 TAF	253.3 TAF	103.0 TAF	2,001.8 TAF
Y Inflow Drain Water	19.2 TAF	239.1 TAF	86.1 TAF	0.0 TAF	30.9 TAF	29.2 TAF	404.5 TAF
Carry-over Drainage Reuse	8.8 TAF	54.7 TAF	4.0 TAF	0.2 TAF	7.5 TAF	0.0 TAF	75.2 TAF
Reclaimed Waste Water	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF
<b>Total Supply</b>	<b>809.2 TAF</b>	<b>1,019.2 TAF</b>	<b>188.7 TAF</b>	<b>40.5 TAF</b>	<b>291.7 TAF</b>	<b>132.2 TAF</b>	<b>2,481.5 TAF</b>
<b>Evapotranspiration of Applied Water</b>							
D Agricultural: ETAW	432.2 TAF	459.3 TAF	93.8 TAF	21.1 TAF	184.4 TAF	77.6 TAF	1,268.4 TAF
E Wildlife Refuge	10.5 TAF	13.9 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	24.4 TAF
M Municipal & Industrial	2.0 TAF	2.3 TAF	0.0 TAF	0.0 TAF	1.0 TAF	0.0 TAF	5.3 TAF
F Fall Flood / Private Wetland: Rice Drainage	2.6 TAF	12.9 TAF	1.6 TAF	0.1 TAF	2.5 TAF	0.0 TAF	19.7 TAF
L Fall Flood / Private Wetland: Supply	16.9 TAF	19.5 TAF	0.1 TAF	0.3 TAF	2.8 TAF	3.1 TAF	42.7 TAF
<b>Other Consumptive Losses</b>							
T Conveyance System Evaporation: Supply	2.5 TAF	3.2 TAF	0.1 TAF	0.1 TAF	0.8 TAF	0.5 TAF	7.2 TAF
I Riparian ET: Supply	13.2 TAF	10.4 TAF	2.0 TAF	0.7 TAF	3.4 TAF	1.5 TAF	31.2 TAF
O Miscellaneous Agricultural ET	6.9 TAF	7.4 TAF	1.3 TAF	0.3 TAF	3.1 TAF	1.3 TAF	20.3 TAF
N Miscellaneous Wildlife Refuge ET	0.2 TAF	0.5 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.7 TAF
M Miscellaneous Fall Flood / Private Wetland ET	1.0 TAF	1.2 TAF	0.0 TAF	0.0 TAF	0.1 TAF	0.1 TAF	2.4 TAF
<b>Total Depletion</b>	<b>488.0 TAF</b>	<b>530.6 TAF</b>	<b>98.9 TAF</b>	<b>22.6 TAF</b>	<b>198.1 TAF</b>	<b>84.1 TAF</b>	<b>1,422.3 TAF</b>
<b>Percolation of Applied Water</b>							
E Conveyance System Percolation	76.3 TAF	102.3 TAF	0.7 TAF	1.3 TAF	22.6 TAF	9.4 TAF	212.6 TAF
R Agricultural Percolation (Surface water)	23.4 TAF	33.3 TAF	2.4 TAF	0.1 TAF	11.2 TAF	6.3 TAF	76.7 TAF
C Wildlife Refuge Percolation	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF
O Fall Flood / Private Wetland Perc.: Supply	2.6 TAF	2.8 TAF	0.0 TAF	0.0 TAF	0.2 TAF	0.3 TAF	5.9 TAF
L Fall Flood / Private Wetland Perc.: Rice Drainage	0.5 TAF	4.9 TAF	0.0 TAF	0.0 TAF	1.0 TAF	0.5 TAF	6.9 TAF
A <b>Subtotal</b>	<b>102.8 TAF</b>	<b>143.3 TAF</b>	<b>3.1 TAF</b>	<b>1.4 TAF</b>	<b>35.0 TAF</b>	<b>16.5 TAF</b>	<b>302.1 TAF</b>
T Percentage of subtotal (Deep Percolation)	36.0 TAF	35.8 TAF	0.9 TAF	0.7 TAF	8.8 TAF	4.1 TAF	86.3 TAF
I Groundwater Percolation (Agricultural)	34.3 TAF	10.3 TAF	7.0 TAF	1.9 TAF	19.6 TAF	0.1 TAF	73.2 TAF
O M & I Percolation (Septic & Outdoor Deep Percolation)	3.0 TAF	1.5 TAF	0.0 TAF	0.0 TAF	0.4 TAF	0.0 TAF	4.9 TAF
<b>N Total Deep Percolation</b>	<b>73.3 TAF</b>	<b>47.6 TAF</b>	<b>7.9 TAF</b>	<b>2.6 TAF</b>	<b>28.8 TAF</b>	<b>4.2 TAF</b>	<b>164.4 TAF</b>
<b>Conveyance System Spill and Seepage</b>							
O Agricultural & Environmental Drainage	15.9 TAF	31.9 TAF	0.2 TAF	0.4 TAF	4.8 TAF	3.0 TAF	56.2 TAF
U To Other DAUs within County	0.0 TAF	28.4 TAF	35.0 TAF	14.7 TAF	0.0 TAF	6.8 TAF	84.9 TAF
T To Same DAU, Out of County	223.2 TAF	53.2 TAF	0.0 TAF	0.0 TAF	26.7 TAF	0.0 TAF	303.1 TAF
F To Other DAU, Out of County	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	25.8 TAF	0.0 TAF	25.8 TAF
L Out of PA, Outflow to Ocean, or Outflow to Salt Sink	0.0 TAF	272.8 TAF	42.7 TAF	0.0 TAF	0.0 TAF	34.1 TAF	349.6 TAF
O Wastewater	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF	0.0 TAF
<b>W Total Outflow</b>	<b>239.1 TAF</b>	<b>386.3 TAF</b>	<b>77.9 TAF</b>	<b>15.1 TAF</b>	<b>57.3 TAF</b>	<b>43.9 TAF</b>	<b>819.6 TAF</b>
<b>Drainage Carry-over to Next Water Year</b>							
	<b>8.8 TAF</b>	<b>54.7 TAF</b>	<b>4.0 TAF</b>	<b>0.2 TAF</b>	<b>7.5 TAF</b>	<b>0.0 TAF</b>	<b>75.2 TAF</b>

# DAUs

- Pros
  - In concept, covers watersheds
  - Water District boundary changes don't affect size of analysis area
    - Water District boundaries can change annually
- Cons
  - Some boundaries are political or arbitrary
  - Water districts cover multiple DAUs
  - Basin water movement between multiple DAUs are difficult to analyze

# Current Analysis

- Collect sub-Water District information
  - Water source information by field (surface, ground or mixed)
  - Points of diversion
  - Acreage used to split WD supply between DAUs and DAU/County
- Estimate WD and minor conveyance
- Collect or estimate basin outflow
- Refine estimates of deep percolation

# History

- In the 1950s the Department used Hydrographic Units (*aerial designation – Bulletin 2*)
- In the early 1960s the Department used DSA Units (*depletions study areas*).
- In the early 1970s the Department converted to DAUs and was first shown in Bulletin 160-74.
- Purpose of DAUs breakout was to make it easier to analysis hydrologic balances.

# Goals

- Watersheds with definable inflows and outflows
- Consistency throughout time
- Correlate groundwater extraction with change in aquifer storage/levels